News Release

Defense Advanced Research Projects Agency

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DARPA PERFORMS WORLD'S FIRST HANDS-OFF AUTONOMOUS AIR REFUELING ENGAGEMENT

The Defense Advanced Research Projects Agency (DARPA), in a joint effort with NASA Dryden Flight Research Center, performed the first-ever autonomous probe-and-drogue airborne refueling operation August 30, at Edwards Air Force Base, Calif. The demonstration was conducted with a NASA F/A-18 configured to operate as an unmanned test bed.

The Autonomous Airborne Refueling Demonstration (AARD) system used GPS-based relative navigation, coupled with an optical tracker, to provide the precise positioning required to put a refueling probe into the center of a 32-inch basket dangling in the air stream behind an airborne tanker. The tanker was equipped with a small relative navigation pallet, but production refueling equipment was not modified in any way. Pilots were on board the F/A-18 for safety purposes.

Autonomous in-flight refueling is a critical enabler for affordable, persistent, unmanned strike systems. "This flight is a significant milestone – it demonstrates that autonomous systems can employ the benefits of air-refueling that have proven so valuable to military aviation," said Lt. Col. Jim McCormick, DARPA program manager.

"We chose to demonstrate the probe and drogue refueling method because it is the most challenging for autonomous systems. The precise station-keeping capability we've demonstrated applies equally to the boom and receptacle method used by most Air Force aircraft," noted McCormick. The same technology also promises to enhance reliability, safety and the range of operating conditions for air refueling manned aircraft.

The flight was the seventh of eight planned for the 15-month AARD proof of concept program. For this particular test, the pilot provided approval to proceed at several stages of the maneuver, but was otherwise hands-off. Operationally, unmanned systems are expected to locate the tanker, form up, accept clearances, refuel, and disengage without any human intervention.

System performance fully met expectations for the flight. "The end-game movement of the autonomous system had none of the last-second, high-gain stabs at the basket that we often see with human pilots. This computer approach was unbelievably stable and smooth, with

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deliberate movements throughout. And when it missed, it was just as smooth when backing up to a restart point," said NASA test pilot Dick Ewers.

The AARD system was operating in benign flight conditions when it successfully engaged the basket in two out of six attempts. As important as the successful engagements, the system safely recovered from each missed attempt. Miss tolerances were tight for this first attempt. During one of the missed attempts, the pilot observed the probe was actually inside the basket when the system pulled back. More robust tracking algorithms and relaxed miss tolerances are planned to be demonstrated on a final flight later this month.

DARPA initiated AARD under the former Joint Unmanned Combat Air Systems program. The AARD system was developed by Sierra Nevada Corp., with team member OCTEC Ltd. providing the optical tracking system. Omega Air Refueling Services operated the modified 707-300 tanker used for the tests.

Successful demonstration of the AARD capability will allow unmanned air system developers and planners to leverage, with confidence, the operational advantages of in-flight refueling.

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A still photo and video clip of the demonstration is available at http://www.darpa.mil/body/news/current/index.asp. Media with questions, please contact Jan Walker, (703) 696-2404, or jan.walker[at]darpa.mil. Contractors or military organizations, contact Lt. Col. Jim McCormick, USAF, at (571) 218-4404.